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Johannes Baur

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EXAMINER

HSIEH, HSIN YI

ART UNIT

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/587,666	<b>Applicant(s)</b> BAUR ET AL.	
	<b>Examiner</b> Hsin-Yi (Steven) Hsieh	<b>Art Unit</b> 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 July 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>20060726, 20070621, 20090202, 20100225</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of Specie II as shown in Fig. 4 in the reply filed on 04/25/2010 is acknowledged.
2. Claim 10 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 04/25/2010.

### ***Priority***

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Information Disclosure Statement***

4. The information disclosure statements (IDS) submitted on 06/21/2007, 02/02/2009, and 02/25/2010 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.
5. The information disclosure statement filed 07/26/2006 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. The NPL of Algora lacks the copy.

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6. The information disclosure statement filed 07/26/2006 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered. A lot of foreign patent documents lack the English abstracts.

### ***Drawings***

7. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 17 of Fig. 1A. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 112***

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. **Claims 1-9 and 11-21** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

10. Claim 1 recites the limitation "downstream" in the 4<sup>th</sup> line of the claim. It is unclear what the "downstream" means as the direction of the "stream" is not specified.

11. Claim 1 recites the limitation "the radiation" in the 6<sup>th</sup> line of the claim. There is insufficient antecedent basis for this limitation in the claim.

12. Claim 1 recites the limitation "the transverse conductivity" in the second last line of the claim. There is insufficient antecedent basis for this limitation in the claim.

13. Claim 2 recites the limitation "a two-dimensional electron and hole gas" in the third line of the claim. It is unclear whether this limitation is the same as the limitation "a two-dimensional electron gas or hole gas" recited in the last line of claim 1.

14. Claim 4 recites the limitation "the number of layers" in the third line of the claim. There is insufficient antecedent basis for this limitation in the claim.

15. Claim 8 recites the limitation "the dopant concentration" in the 5<sup>th</sup> line of the claim. There is insufficient antecedent basis for this limitation in the claim.

16. Claim 8 recites the limitation "the region" in the 5<sup>th</sup> line of the claim. There is insufficient antecedent basis for this limitation in the claim.

17. Claim 8 recites the limitation "the layer" in the last line of the claim. There is insufficient antecedent basis for this limitation in the claim.

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18. Claim 21 recites the limitation "the emitted radiation" in the 4<sup>th</sup> line of the claim. There is insufficient antecedent basis for this limitation in the claim.

19. Claims 3, 5-7, 9, and 11-20 are rejected because they depend on the rejected claim 1.

***Claim Rejections - 35 USC § 102***

20. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

21. **Claims 1-4, 6-8, 11, 15 and 17** are rejected under 35 U.S.C. 102(b) as being anticipated by Udagawa (US 6,541,797 B1) as can be understood since claims 1-9 and 11-21 have been rejected under 35 U.S.C. 112.

22. Regarding **claim 1**, Udagawa teaches a thin-film LED (150; Fig. 14, col. 24 line 31) comprising: an active layer (light emitting layer 102; Fig. 14, col. 23 line 2), which emits electromagnetic radiation (light) in a main radiation direction (upward direction in Fig. 14); a current expansion layer (107, 103, 112; Fig. 14, col. 23 lines 30-40), which is disposed downstream of (above) the active layer (102) in the main radiation direction (upward direction in Fig. 14) and is made of a first nitride compound semiconductor material (112 of GaN; col. 23 line 37); a main area (the top surface of 112), through which the radiation emitted in the main radiation direction (upward direction in Fig. 14) is coupled out (see Fig. 14); and a first contact layer (electrode 123; Fig. 14, col. 24 line 27) arranged on the main area (the top surface of 112), wherein the transverse conductivity of the current expansion layer (107, 103, 112) is increased

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by formation of a two-dimensional electron gas or hole gas (the formation of a two-dimensional electron gas is shown in Fig. 10, col. 21 lines 43-57, and the increase in transverse conductivity is an intrinsic property of the two-dimensional gas).

23. Regarding **claim 2**, Udagawa also teaches the thin-film LED as claimed in claim 1, wherein in order to form a two-dimensional electron or hole gas in the current expansion layer (107, 103, 112), at least one layer (107 and 103) made of a second nitride compound semiconductor material ( $\text{Al}_{0.10}\text{Ga}_{0.90}\text{N}$ ; col. 23 lines 30-35) having a larger electronic band gap than the first nitride compound semiconductor material (112 of GaN; col. 23 line 37) is embedded in the current expansion layer (107, 103, 112; see Fig. 14).

24. Regarding **claim 3**, Udagawa also teaches the thin-film LED as claimed in claim 2, wherein a plurality of layers (107 and 103) made of the second nitride compound semiconductor material ( $\text{Al}_{0.10}\text{Ga}_{0.90}\text{N}$ ) are embedded in the current expansion layer (107, 103, 112).

25. Regarding **claim 4**, Udagawa also teaches the thin-film LED as claimed in claim 2, wherein the number of layers (107 and 103) made of the second nitride compound semiconductor material ( $\text{Al}_{0.10}\text{Ga}_{0.90}\text{N}$ ) is between 1 and 5 inclusive (two).

26. Regarding **claim 6**, Udagawa also teaches the thin-film LED as claimed in claim 2, wherein the first nitride compound semiconductor material is GaN (112 of GaN; col. 23 line 37).

27. Regarding **claim 7**, Udagawa also teaches the thin-film LED as claimed in claim 2, wherein the second nitride compound semiconductor material is  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  where  $0.1 \leq x \leq 0.2$  ( $\text{Al}_{0.10}\text{Ga}_{0.90}\text{N}$ ; col. 23 lines 30-35).

28. Regarding **claim 8**, Udagawa also teaches the thin-film LED as claimed in claim 2, wherein the at least one layer (107 and 103) made of the second nitride compound

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semiconductor material ( $\text{Al}_{0.10}\text{Ga}_{0.90}\text{N}$ ) has a doping (103 has a doping of  $8 \times 10^{16} \text{ cm}^{-3}$ ; col. 23 lines 34-36), the dopant concentration ( $8 \times 10^{16} \text{ cm}^{-3}$ ) being higher in the regions (103) adjoining (connecting) the current expansion layer (107, 103, 112) than in a central region of the layer (the central region of 107 which is undoped; col. 23 lines 30-33).

29. Regarding **claim 11**, Udagawa also teaches the thin-film LED as claimed in claim 1, wherein the active layer (102) includes  $\text{In}_x\text{Al}_y\text{Ga}_{1-x-y}\text{N}$  where  $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$  and  $x+y \leq 1$  ( $\text{Ga}_{0.85}\text{In}_{0.15}\text{N}$  of 102a; Fig. 11).

30. Regarding **claim 15**, Udagawa also teaches the thin-film LED as claimed in claim 1, wherein the first contact layer (the first contact layer can also be the lower layer of 123) comprises no aluminum (the lower layer of 123 is formed of gold; col. 24 lines 28-30).

31. Regarding **claim 17**, Udagawa also teaches the thin-film LED as claimed in claim 1, wherein the first contact layer (the first contact layer can also be 122) has a lateral structure (see Fig. 13) comprising a contact area (the central round area) and a plurality of contact webs (the radiated fingers; see Fig. 13).

### ***Claim Rejections - 35 USC § 103***

32. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.



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33. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

34. **Claims 5, 9, 12-14 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Udagawa (US 6,541,797 B1) as applied to claims 1 and 2 above as can be understood since claims 1-9 and 11-21 have been rejected under 35 U.S.C. 112.

35. Regarding **claim 5**, Udagawa also teaches the thin-film LED as claimed in claim 2, wherein the at least one layer (103) made of the second nitride compound semiconductor material ( $\text{Al}_{0.10}\text{Ga}_{0.90}\text{N}$ ) has a thickness of 200 nm ( $0.2\mu\text{m}$ ; col. 23 lines 34-35) which is very close to claimed range of 10 nm to 100 nm.

Furthermore parameters such as the thickness of the at least one layer in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired film quality during device fabrication. Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to incorporate the thickness of the at least one layer within the range as claimed in order to form a high quality film.

36. Regarding **claim 9**, Udagawa also teaches the thin-film LED as claimed in claim 2, wherein the first and second nitride compound semiconductor materials ( $\text{GaN}$  and  $\text{Al}_{0.10}\text{Ga}_{0.90}\text{N}$  of 112 and 103, respectively) are p-doped (col. 23 lines 34-37).

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Udagawa does not teach the first and second nitride compound semiconductor materials are n-doped.

It would have been an obvious matter of design choice to have the first and second nitride compound semiconductor materials n-doped, since the device can perform equally well with all the doping changing their polarity, which is well known in the field of semiconductor manufacturing.

37. Regarding **claim 12**, Udagawa also teaches the thin-film LED as claimed in claim 1, wherein at least one edge length (horizontal length in Fig. 14) of the main area (the top surface of 112).

Udagawa does not teach wherein at least one edge length of the main area is 400  $\mu\text{m}$  or more.

Parameters such as the one edge length of the main area in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device performance such as the total output power during device fabrication. Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to incorporate the one edge length of the main area within the range as claimed in order to achieve desired total output power.

38. Regarding **claim 13**, Udagawa also teaches the thin-film LED as claimed in claim 12, wherein at least one edge length (horizontal length in Fig. 14) of the main area (the top surface of 112).

Udagawa does not teach wherein at least one edge length of the main area is 800  $\mu\text{m}$  or more.

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Parameters such as the one edge length of the main area in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device performance such as the total output power during device fabrication. Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to incorporate the one edge length of the main area within the range as claimed in order to achieve desired total output power.

39. Regarding **claim 14**, Udagawa also teaches the thin-film LED as claimed in claim 1, the thin-film LED (Fig. 14).

Udagawa does not teach wherein operation of the thin-film LED with a current intensity of 300 mA or more is provided.

This limitation is considered as “intended use”. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex Parte Masham*, 2 USPQ F.2d 1647 (1987).

40. Regarding **claim 16**, Udagawa also teaches the thin-film LED as claimed in claim 1, wherein a portion of the total area of the main area (the top surface of 112) is covered by the first contact layer (the first contact layer can also be 122; see Figs. 13 and 14).

Udagawa does not teach wherein less than 15% of the total area of the main area is covered by the first contact layer.

Parameters such as the percentage of the total area of the main area covered by the first contact layer in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device performance during device

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fabrication. Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to incorporate the percentage of the total area of the main area covered by the first contact layer within the range as claimed in order to achieve desired device performance.

41. **Claims 18-20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Udagawa as applied to claim 17 above, and further in view of Nozaki et al. (US 5,744,828 A) as can be understood since claims 1-9 and 11-21 have been rejected under 35 U.S.C. 112.

Udagawa teaches, regarding to **claim 18**, the contact area (the central round area of 122).

Udagawa does not teach, regarding to **claim 18**, wherein the contact area is surrounded by at least one frame-type contact web, the frame-type contact web being connected to the contact area by means of at least one further contact web, regarding to **claim 19**, wherein the frame-type contact web has a square, rectangular or circular form, and regarding to **claim 20**, wherein the number of frame-type contact webs is one, two or three.

In the same field of endeavor of LED, Nozaki et al. teaches, regarding to **claim 18**, wherein the contact area (bonding pad 21; Fig. 1, col. 3 line 60) is surrounded by at least one frame-type contact web (current supply electrode 22; Fig. 1, col. 3 lines 60-61), the frame-type contact web (22) being connected to the contact area (21) by means of at least one further contact web (straight lines 22a; Fig. 1, col. 4 line 14), regarding to **claim 19**, wherein the frame-type contact web (22) has a square, rectangular or circular form (square form; see Fig. 1), and regarding to **claim 20**, wherein the number of frame-type contact webs (22) is one, two or three (three; see Fig. 1).

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It would have been obvious to one of ordinary skill in the art at the time of invention was made to combine the inventions of Udagawa and Nozaki et al. and use the frame-type contact web as taught by Nozaki et al., because the frame-type contact web lets the device uniformly emit light, to thereby improve the light emission efficiency of the device as taught by Nozaki et al. (col. 5 lines 12-16).

42. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Udagawa as applied to claim 1 above, and further in view of Schubert (US 2003/0111667 A1) as can be understood since claims 1-9 and 11-21 have been rejected under 35 U.S.C. 112.

43. Regarding **claim 21**, Udagawa also teaches the first contact layer (123).

Udagawa does not teach wherein a second contact layer, which reflects the emitted radiation, is provided on a side of the active layer opposite to the first contact layer, the first contact layer having a contact area and the second contact layer having a cutout in a region opposite the contact area.

In the same field of endeavor of LED, Schubert teaches wherein a second contact layer (ohmic contacts 182 and reflective film 184; Fig. 8, paragraph [0029]), which reflects the emitted radiation (paragraph [0029]), is provided on a side (bottom side) of the active layer (active region 120; Fig. 8, paragraph [0024]) opposite to the first contact layer (top contact 109; Fig. 8, paragraph [0024]), the first contact layer (109) having a contact area (the contact area between 109 and 160) and the second contact layer (182 and 184) having a cutout (central portion 185) in a region (185) opposite the contact area (the contact area between 109 and 160; see Fig. 8).

It would have been obvious to one of ordinary skill in the art at the time of invention was made to combine the inventions of Udagawa and Schubert and use the ohmic contacts as taught

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by Schubert, because the ohmic contacts increase the portion of the light that reaches and is reflected by the underling reflective film and also increase the light extraction efficiency as taught by Schubert (paragraph [0029]).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsin-Yi (Steven) Hsieh whose telephone number is 571-270-3043. The examiner can normally be reached on Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lynne A. Gurley/  
Supervisory Patent Examiner, Art Unit  
2811

/H. H./

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Examiner, Art Unit 2811

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